

## **REMARKS**

Claims 1 and 3 are pending. Claim 3 is objected to. Claim 1 stands rejected under 35 U.S.C. §103. By this response, Applicants have amended Claim 3. Claims 1 and 3 remain pending.

## **Allowable Claim**

Applicants note with appreciation the indication that Claim 3 would be allowable if rewritten in independent form. Claim 3 has been so rewritten. No new matter has been introduced. Allowance of independent Claim 3 is respectfully requested.

## **Information Disclosure Statement**

Enclosed herewith is an Information disclosure statement along with copies of the references cited therein. Applicants respectfully request entry of the IDS and consideration of the references therein on the record.

## **Claim Rejections - 35 U.S.C. §103**

Claim 1 stands rejected as obvious in view of Kato et al. The Office Action rephrases (and dismisses) our previous remarks, stating:

- (1) The sulfur content of the steel as a whole would not necessarily correspond to the sulfur content of the inclusions required by the claimed invention; and
- (2) Kato et al. does not teach the use of Ti in the steel.

With respect to (1) above, Applicants respectfully submit that they have factually demonstrated that sulfur content does not necessarily establish an upper limit for the equilibrium

sulfur soluble amount value in the CaO-containing oxide (%S<sub>inc</sub>). Indeed, Applicants have pointed to Comparative Example 1 of their own specification, which shows an equilibrium sulfur soluble amount value in the CaO-containing oxide (%S<sub>inc</sub>) that is fully ten (10) times greater than the sulfur content. By that example, it is possible, since Kato et al. gives us no opposed teaching, that the steel of Kato et al. could also have such a result, i.e. a 10-fold increase in the %S<sub>inc</sub> from the calculated 0.004% sulfur value provided on page 2-3 of the Office Action yielding %S<sub>inc</sub> of 0.4%. Such a product is clearly outside the claimed range. Thus, the teachings of Kato et al. do not necessarily lead to the claimed steel composition.

According to MPEP §2112:

EXAMINER MUST PROVIDE RATIONALE OR EVIDENCE TENDING TO SHOW INHERENCY

The fact that a certain result or characteristic may occur or be present in the prior art is **not** sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)(reversed rejection because inherency was based on what would result due to optimization of conditions, not what was **necessarily** present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981).

"In relying upon the theory of inherency, **the examiner must provide a basis in fact and/or technical reasoning** to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) ([underlining] in original) (bold emphasis added.)

In 1999, the Court of Appeals for the Federal Circuit wrote, in *In re Robertson*, 49 USPQ2d 1949, at 1950-51:

To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is **necessarily** present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991). "Inherency, however, may **not** be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is **not** sufficient." *Id.* at 1269, 20 U.S.P.Q.2d at 1749

(quoting *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981). (Bold emphasis added.)

The Office Action appears to recognize the Federal Circuit's teaching, but supports its contradictory position by stating:

while the examiner acknowledges that the sulfur content of the inclusions in the steel would not necessarily correspond to the sulfur content in the steel as a whole, there is no reason to believe that the steel of Kato et al. would have inclusions containing high content of sulfur.

The sulfur is primarily controlled with regards to the calcium content, similarly to that of the claimed invention, and the composition and type of steel used in Kato et al. and the claimed invention are substantially similar. Therefore, it would be expected that the sulfur content of the inclusions of Kato et al. would be similar to that of the inclusions of the claimed invention, and the steels would be substantially the same. (Emphasis added.)

The theory of inherency set forth in the Office Action is at least in part based upon a similarity in structure or composition of the steel of the invention and that of Kato et al. For arguments sake, Applicants note that there are three (3) "substantially similar" compositions in question in this case: 1) the claimed invention, 2) Comparative Example 1, and 3) the composition of Kato et al. The table below summarizes the composition of each.

	<b>Example 1</b>	<b>Comparative Example 1</b>	<b>Kato et al.</b>
Ti	0.040 wt%	0.040 wt%	
Al	0.001 wt%	0.030 wt%	0.005-0.06 wt%
Ca	0.0015 wt% (15 ppm)	0.0020 wt% (20 ppm)	0.0005-0.05 wt%
S	0.010 wt%	0.010 wt%	preferably 0.003 to 0.015 wt%
Product			
wt% S	0.010	0.010	
<b>% S<sub>inc</sub></b>	<b>0.0084 wt%</b>	<b>0.106 wt%</b>	

According to the logic of the Office Action, each of the three should have the inherent characteristic %S<sub>inc</sub>, less than or equal to 0.03%. However, as noted above, and in the previous response, 2) Comparative Example 1, despite its similar make-up, has %S<sub>inc</sub> of 0.106%wt, well

above the claimed range. This teaching, found in the original specification, along with the Declaration of Mr. Nabeshima, co-inventor to this invention and Kato et al., which states unequivocally that the steel of Kato et al. does not necessarily produce steel having the claimed %S<sub>inc</sub>, clearly rebuts any showing presented in the Office Action of any similarity between the steel compositions tending to show the inherency of  $\leq 0.03\%$  S<sub>inc</sub>. There simply is no teaching on this record that %S<sub>inc</sub> of 0.03% or less flows naturally from the teaching of the prior art or even from similar compositions. Accordingly, Applicants respectfully submit that the burden to show inherency of the claimed characteristics and properties has not been met since there is no evidence on this record that such properties do necessarily flow from the teaching of the prior art.

With respect to (2) above, Applicants note that the previous response pointed out the lack of discussion of Ti in Kato et al. as part of a larger showing of the divergence of the reference from the invention. Page 7 of the August 12, 2002 response points out that Kato et al. is silent with respect to "controlling the amount of oxide inclusions, Al, Ti, the optical basicity and casting temperature." The lack of discussion concerning Ti content in Kato et al. is just one example in the list that shows that Kato et al. simply does not provide motivation to lead those skilled in the art to the claimed invention without using Applicants' own teaching as a guide, which, of course, is impermissible hindsight.

There are further reasons why the rejected claims should be allowed over Kato et al. The Official Action asserts that (%S inc.) is primarily controlled by the Ca content. The Applicants would like to point out that CaO and the composition of the oxides are also important elements to control (%S inc.). (This is suggested in Claim 3.) In the case of the Al killed steel disclosed in Kato (which means oxide inclusion substantially consists of a CaO-Al<sub>2</sub>O<sub>3</sub> system), for example, the

amount of oxide (and, thus, the O content) in the steel also affects (%S inc.) through the oxide composition. That is, the CaO content in the oxides is shown in Fig. 4.

Taking Example 4 in Table 1 of Kato et al. as an example, the Applicants can demonstrate how much O is required in the steel. The S content in Example 4 is calculated as 0.004 wt% from Table 1. To satisfy (%S inc.) to be 0.03 wt% or less, the CaO content in the oxides should be about 44% or less as shown in the curve titled “S=0.004% / CaO-Al<sub>2</sub>O<sub>3</sub>” in Fig. 4 of this Application. Ca/O (the ratio of the amount of Ca in the oxides with the amount of O in the oxides on a mass basis) corresponding to the maximum CaO (44%) is calculated to be 0.81 by the procedure shown in the attached Appendix. Assuming all Ca and O in the steel are gathered in the oxides, for rough approximation, the O content in the steel should be 0.0062 wt% or more to satisfy (%S inc.) to be 0.03 wt% or less, because the Ca content is 0.0050 wt%.

The maximum CaO content in the oxides (to satisfy (%S inc.) to be 0.03 wt% or less) could be roughly estimated by assuming a linear relationship with the S content in the steel and maximum CaO content in the oxide. Note that when the S content is 0.004 wt%, the maximum CaO content is about 44%, and when the S content is 0.010 wt%, the maximum CaO content is about 24%, as shown in Fig. 4.

Thus, the minimum O content in the steel (to satisfy (%S inc.) to be 0.03 wt% or less) for each Example in Table 1 can be estimated as follows:

No.1	Ca:0.0025%	S:0.006%	Max CaO:37%	Max Ca/O:0.66	Min O:0.0038%
No.2	Ca:0.0015%	S:0.013%	Max CaO:14%	Max Ca/O:0.22	Min O:0.0067%
No.3	Ca:0.0005%	S:0.015%	Max CaO:7.3%	Max Ca/O:0.11	Min O:0.0044%
No.4	Ca:0.0050%	S:0.004%	Max CaO:44%	Max Ca/O:0.81	Min O:0.0062%
No.5	Ca:0.0010%	S:0.010%	Max CaO:24%	Max Ca/O:0.40	Min O:0.0025%
No.7	Ca:0.0025%	S:0.010%	Max CaO:24%	Max Ca/O:0.40	Min O:0.0062%

In the Examples, Kato et al. only discloses that the O content in the steel falls in the range of 0.001 to 0.008 wt%. There might be a possibility that the O content would accidentally fall in the range more than above minimum value, which might raise the possibility that (%S inc.) would be 0.03 wt% or less in at least 80% of CaO-containing oxides having a diameter of 2  $\mu\text{m}$  or larger. However, Kato et al. does not disclose, teach or suggest that the O content should be controlled with the Ca content to control the composition of the oxides. In this invention, by controlling (%S inc.) to 0.03 wt% or less, a remarkable decrease in rust defects is surprisingly achieved as shown in Fig. 2.

It is also notable that Kato suggests to limit maximum the O content, which means that the lesser O content is more preferable, as the general concept of steel making. On the contrary, some amount of O is required to control the CaO content in the oxides in the case of Al killed steel.

Accordingly, Applicants respectfully request that the rejection be withdrawn.

In view of the reasoning set forth above, Applicants respectfully submit that all pending claims are in condition for allowance. Accordingly, early reconsideration and allowance of all pending claims is respectfully requested.

Respectfully submitted,

  
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